much tedious lecturing," as Mr. Wells has it. It created, among Cambridge mathematicians, a school of thought that was probably advantageous to their subject as well as to themselves.

But Mr. Wells's scheme of world-wide education, like the national system of education foreshadowed for England in Mr. Fisher's great Act of 1918, depends for its realisation upon the money being available. Mr. Wells has no doubt where the money is to come from; and, in truth, there can be little doubt about the matter. According to a recent American book, the United States spent last year no less than 93 per cent. of the national revenues upon wars old and new: that is, on war loan charges, on war pensions, and on maintaining military and naval forces. Great Britain, not being made up of forty-eight States with separate incomes, naturally spent a smaller proportion of her national income on war charges; but last year, and again in the Estimates for this year, the proportion of the national revenues that this country is spending on wars old and new is no less than 64 per cent.—more than twelve shillings in every pound of taxes. When we remember that a simple agreement between a few great naval Powers is all that is needed to abolish battleships, and that a battleship costs, in capital, some 8,000,000*l.* sterling, or, in income (for interest, depreciation, and repairs, but not including *personnel*), 1,000,000*l.* a year—more than ten times the British contribution to the League of Nations—we wonder that this money is not diverted to remunerative expenditure. The whole contribution of the British Government to university education is only 2,000,000*l.* (of which half a million pounds is a special grant for superannuation purposes) this year, and used to be much less. It is thus equal to the cost of maintaining the structure and equipment of two battleships. Mr. Wells says that we need to press "for a ruthless subordination of naval, military, and Court expenditure to educational needs." At all events, we need to come to an agreement with the other nations of the world, most of whose incomes are at present insufficient to meet their expenditure, for a general limitation of armaments, that would enormously reduce the burdens of taxation and set free far more than sufficient money to expand and improve our educational organisations as rapidly as is humanly possible.

Mr. Wells's book is marred by minor defects, which are only minor because of the greatness of the whole. Thus he would apparently have his readers believe that the world commonwealth, which he regards as the ultimate goal, should be attained by the immediate absorption of the existing seventy or eighty independent sovereign States of the world into a single super-State. Such a first step would certainly be a false step, even if it were in any way practicable. How would it, for example, be possible to persuade Japan to place the control of her destinies in the hands of a Parliament, Congress, or Assembly most of the members of which would be of European race? The first step towards increasing the political unity of the nations is surely their co-operation in multifarious works for the benefit of mankind, and especially in the abolition of world-war. This is what is being done by the "quite inadequate League of Nations at Geneva," which consists, after all, of forty-eight sovereign States representing three-quarters of the population of the earth.

Moreover, Mr. Wells is surely mistaken in supposing that we must get rid of patriotism if we are to have an adequate sense of world citizenship. Loyalty to a smaller group is not necessarily inconsistent with higher loyalty to a larger group that includes the smaller. An undergraduate who is asked to play for his university and for his college on the same day will play for his university, and not for his college; but he is not on that account less loyal to his college. The Yorkshireman or the Cornishman who loves his county is not on that account an inferior Englishman; nor is one who loves England likely to be a less loyal member of the British Commonwealth of nations than one who has no feeling for his own people; nor, again, has it ever been suggested that loyal members of the British Commonwealth are on that account feebler supporters of the League of Nations. J. C. M. G.

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## Practical Chemistry.

(1) *Introduction to Qualitative Chemical Analysis.* By Th. W. Fresenius. Seventeenth edition. Translated by C. Ainsworth Mitchell. Pp. xx + 954. (London: J. and A. Churchill, 1921.) 36*s.* net.

(2) *A Text-book of Practical Chemistry.* By G. F. Hood and Major J. A. Carpenter. Pp. xii + 527. (London: J. and A. Churchill, 1921.) 21*s.* net.

(3) *Public Health Chemical Analysis.* By R. C. Frederick and Dr. A. Forster. Pp. viii + 305. (London: Constable and Co., Ltd., 1920.) 21*s.* net.

(1) THE treatises on chemical analysis—qualitative and quantitative—planned so far back as 1840 by C. Remigius Fresenius,

the original proprietor and director of the well-known Wiesbaden laboratory, have enjoyed an almost unchallenged position in Germany as standard works for more than three-quarters of a century. During that period they have been frequently revised and reprinted. English editions of these works have been published by the firm of J. and A. Churchill at various times, and are, of course, well known in this country and in America, but have never acquired the same popularity as in Germany. Manuals of chemical analysis written by English and American authors have been found more suitable for class and laboratory instruction. Chemical analysis is, of course, an art which can be acquired only by practice, and a book on the subject should be substantially a *vade-mecum,* which is defined to be anything, especially a book or manual, a person carries with him for daily use. Now this is precisely what the works of Fresenius are not. They have grown so unwieldy that it is impossible to use them as manuals or as the constant companion of the student on the laboratory bench. They are to be regarded rather as works of reference to be consulted in the college library, in which the learner may hope to find an account, more or less detailed, of everything connected with the subject, arranged systematically, and with bibliographical references to the original sources of information.

Mr. Mitchell's book is a translation of the seventeenth edition of the original work brought up to date and made to conform with modern conceptions by Dr. Th. Wilhelm Fresenius. In its English dress it is a portly octavo volume of nearly 1000 pages, and is, in effect, a text-book on general chemistry with special reference to qualitative analysis. Presumably, in its present form, it is primarily intended to supplement the course of lectures given in the Wiesbaden school. It has been translated into English with meticulous care, and so preserves certain blemishes which are characteristic of the original. Practically all the bibliographical references are to German periodicals, and largely to Fresenius's *Zeitschrift für analytische Chemie.* German names, of course, preponderate. English, French, and American chemists have made notable contributions to analytical chemistry, but their names are conspicuous by their absence. Mr. Mitchell is the editor of the *Analyst,* and he must have been struck by the entire omission of any reference to that journal, which now extends to forty-six volumes. Surely in this mass of analytical literature there must be an occasional grain of wheat that might have been allowed to germinate in a foreign soil. We do not know if the English editor was in any way restricted, but in preparing the translation for English-speaking peoples it was, we think, desirable that he should conform to generally accepted English nomenclature and terminology. When the International Committee on Atomic Weights was created, one of its earliest duties was to unify the nomenclature of the elements. Not only were the atomic weights to be made uniform throughout the various nations which were represented on the Committee, but also the names and symbols of corresponding elements. The general principle suggested was that the original name should be retained. This recommendation, although adopted by the American, French, and English representatives, was systematically ignored by their German colleagues. Glucinum, which was discovered by Vauquelin, was still called beryllium, apparently for no other reason than that Klaproth had so termed it. Columbium was first detected and so named by Hatchett in 1801, but this element is invariably called niobium by the Germans, because Rose in 1844 had inferred the presence of a new element, which he had thus named, in the columbites of Bodenmais. It was afterwards found that Rose's supposed new element had no existence; but, as the name "niobium" had been introduced into German chemical literature, it was applied to Hatchett's columbium, discovered more than forty years previously. We think, therefore, in the light of these facts, Mr. Mitchell would have been well advised to conform to English, French, and American procedure.

The book is free from typographical errors, and has evidently been carefully read. There are, however, a few errata which are duly noted; but that the atomic weight of titanium should be 48·1 instead of 40·1 (p. 197) is not one of them.

(2) Messrs. Hood and Carpenter's "Text-book of Practical Chemistry" is claimed by its authors to be "a whole-hearted attempt . . . to indicate the *best methods* of doing everything." Whatever may be thought of the claim, the book, in plan and execution, is in striking contrast with that just noticed. Whereas that work is specially, and almost exclusively, directed to the subject of qualitative analysis, the present authors seek to cover the whole domain of practical chemistry—inorganic and organic preparations, inorganic and organic qualitative and quantitative analysis by gravimetric, electrolytic, and volumetric methods, including gas analysis—within the compass of half the number of pages to which the work of Fresenius extends.

Although the book and its arrangement are, apparently, largely based upon the experience of the authors as science teachers in schools, it is presumably intended for a higher grade of instruction than that usually given to schoolboys. Indeed, the authors, at times, think it unnecessary to mention certain elementary matters, for the reason that they are probably already known to beginners. They have, however, not been very consistent in this respect. Very elementary things are occasionally treated at considerable length, and space is thereby sacrificed to comparatively unimportant subjects which might well have been devoted to fuller details of more advanced or more difficult matters. The work, in fact, suffers from a lack of a sense of proportion; it bears marks of haste in preparation, as if the authors had not thought out with sufficient care the details of their scheme. The general plan of the work is excellent, but it would be quite impossible for any student, however hard-working, to overtake the whole within the period usually allotted to his training. The time given to the preparation of substances, if he is expected to make any considerable proportion of those enumerated, would alone consume a large fraction of it.

Under the direction of a capable teacher the book is calculated to be of service, if judiciously used, as a laboratory manual. Anyone who had worked through it, with due attention to its directions, would be well equipped with a knowledge and experience of operative chemistry.

(3) The little work on "Public Health Chemical Analysis," by Mr. R. C. Frederick and Dr. Aquila Forster, is apparently designed for the use of the Medical Officer of Health who may be called upon to make analytical inquiries, or may desire to inform himself of the methods employed by the Public Analyst in connection with matters with which he is directly concerned. After a somewhat bald introduction on the general principles of gravimetric and volumetric analysis, the book deals with such subjects as the chemical examination of air, water, sewage, trade waste, and effluents; the analysis of ordinary foods, such as milk and milk-products, flour, bread, sugars, jams, confectionery, proprietary foods, alcoholic liquors, tea, coffee, cocoa, and condiments; the detection of metallic poisons in foodstuffs; disinfectants; soap; rag flock, etc. The methods described are those in common use by analysts, and present no features of novelty. They may be accepted as trustworthy, and well within the competence of an officer who may only occasionally be required to undertake them. The book is well printed, adequately illustrated, and provided with a good index.

## The Nature of Man.

*The Origin of Man and of his Superstitions.* By Carveth Read. Pp. xii + 350. (Cambridge: At the University Press, 1920.) 18*s.* net.

ONE of the legacies left by the Darwinian controversy has been an intense interest in the highly speculative questions centring round the transition that took place from our semi-human to our human ancestry. The subject has an intense fascination for many, and they will find ample room for the exercise of their imagination while reading the mass of material brought together by the author in support of his hypothesis. He assumes that our early ancestors were large anthropoid apes which took to hunting and a more carnivorous diet, and thus changed profoundly their "former, peaceable, frugivorous habit." Thus there was a selection of those qualities most effective for hunting game. Some of the Primates used unwrought weapons, co-operated in defence, and could communicate with each other—*e.g.* the early hunters went in packs, and thus resembled wolves; indeed, man "became at first a sort of wolf-ape."

In the course of his reflections upon the nature of man the author concludes that "man, in character, is more like a wolf or dog than he is like any other animal." Hence "the Nordic sub-race [of the Mediterranean, we may suppose], with its fair hair, . . . has the appearance of an Arctic beast of prey, like the polar bear." The adoption of a hunting life had many consequences: each pack had its own hunting ground; hence the idea of property; co-operative hunting increased intelligence. The "constructive impulse" thereby became an "absorbing passion," and the use of language was stimulated. The first wars, probably, were waged for hunting grounds; thus the more "virile" and compact of the "wolf-ape" packs predominated, and presumably led to that triumph of Nature, the "Arctic beast of prey"—the Nordic sub-race. Sports and games have been stimulated by the hunting life. Further, "I offer the suggestion that the origin of laughter and the enjoyment of broad humour . . . may be traced to . . . occasions of riotous exhilaration and licence" following on a successful hunt. Hunting life does not explain, says the author, the origin of magnanimity, friendliness, etc.

Mr. Read then turns to the origins of beliefs.

> "Savages of the lowest culture have few beliefs that can be called positively injurious. . . . Taboos do more good by protecting person, property, and custom than they do harm by restricting the use of foods. . . . Many rites and observances are sanitary. Totemism rarely does any harm, and